Amendments to the Drawings:

The attached six (6) sheets of drawings include changes to FIGS. 2-7. These sheets include FIGS. 2-7 and replace the sheets currently on file depicting FIGS. 2-7. In FIGS. 2-7, the German text has been translated to English.

Attachment: Six (6) replacement sheets of drawings

REMARKS/ARGUMENTS

The claims are 11-20. Claims 11, 14, 15 and 17 have been amended to improve their form, and new claim 20 has been added to include subject matter canceled from claim 14. Support for the claims may be found, *inter alia*, in the first full paragraph on page 6 of the disclosure. Reconsideration is expressly requested.

The Examiner objected to the drawings because the drawings included German labels for the charts or graphs. In response, Applicants submit herewith six (6) replacement sheets of drawings in which FIGS. 2-7 have been amended to include English labels instead of German labels. In amended FIG. 2, Valve Position, Open, Closed, Beginning of the Cycle, and End of the Cycle are used as labels for the circuit schematic and replace the German labels used previously. In amended FIGS. 3-7, Volume Flow Rate and Time are used as labels for the graph and replace the German labels used previously. In view of the foregoing amendments to the drawings, it is believed that the Examiner's objections to the drawings are overcome, and Applicants respectfully request withdrawal of the objections to the drawings on this basis.

The Examiner objected to claim 15 as being unclear as to what is being claimed. In the Examiner's view, claim 15 is logically consistent with claim 11 on which claim 15 depends only when the number of control valves is two.

This rejection is respectfully traversed.

It is respectfully submitted that claim 15 is logically consistent for dependency on claim 11, particularly when there are more than two control valves for the membrane filter system. Claim 11 defines three steps in the method and claim 11 recites that the three method steps are performed one after the other until the aeration cycle starts anew with the first membrane module. It is respectfully submitted, however, that this recitation in claim 11 does not preclude an intermediate step or steps being performed between the three method steps or between repeats of the three methods steps as is described for example in the first paragraph of page 10 of the specification and is shown in FIG. 4 of the specification, where at two different intermediate time periods during the first cycle (labeled as T) all six of the valves are aerated at the same time (shown in the 5th and 13th horizontal segments in the chart in FIG. 4). If a second step is followed by an intermediate step which is followed by a third step, the third step is still performed after the

second step. Thus, all of the membrane modules can be aerated with partial air streams, at the same time, once or multiple times, which partial air streams result from opening of all of the control valves, *within the aeration cycle*, as is recited in claim 15, while all of the membrane modules are aerated in accordance with the three method steps of claim 11, one after the other, until the aeration cycle starts anew with the first membrane module, as is recited in claim 11.

For further clarification, Applicants have amended claim 15 to recite that the method further includes aerating, within the aeration cycle, all of the membrane modules with partial air streams, at the same time, once or multiple times, which partial air streams result from opening of all of the control valves.

In view of the foregoing, Applicants respectfully request withdrawal of the objection to claim 15 on this basis.

The Examiner rejected claim 14 under 35 U.S.C. 112, second paragraph, as being indefinite because of the recitation of a narrow range following the recitation of a broader range. Accordingly, Applicants have deleted the narrow range from claim 14 so that claim 14 recites only the broader range. The narrow range has been added as new dependent claim 20. In view of the

foregoing, it is believed that the Examiner's rejection under 35 U.S.C. 112, second paragraph, of claim 14 is overcome, and Applicants respectfully request withdrawal of the rejection of claim 14 on this basis.

The Examiner rejected claim 17 under 35 U.S.C. 112, second paragraph, as being indefinite in view of a clerical error. Accordingly, Applicants have amended claim 17 to recite that *all* of the membrane modules are aerated simultaneously. Support for this amendment to claim 17 can be found, *inter alia*, in the first full paragraph on page 6. In view of the foregoing, it is believed that the Examiner's rejection under 35 U.S.C. 112, second paragraph, of claim 17 is overcome, and Applicants respectfully request withdrawal of the rejection of claim 17 on this basis.

Claims 11-16, 18 and 19 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application Publication 2003/0127389 to *Rabie et al.*

This rejection is respectfully traversed.

As set forth in independent claim 11 as amended, Applicants' invention provides a method for aerating multiple membrane

modules of a membrane filter system operating in submerged operation. Air or a gas is supplied to the membrane modules from a common source. The air or gas rises in the liquid to be purified, in the form of bubbles, on the outside of the membrane. Valves are disposed in the feed lines to the membrane modules. The valves are activated according to a predetermined circuit schematic. Control valves are used as valves, which can assume only either the open or closed position, and thus release or block the supply of air to an assigned membrane module.

In a first method step, the control valve assigned to a first membrane module is open, while the control valves of all the other membrane modules are closed, so that aeration of the first membrane module takes place. At the beginning of a second method step, the control valve assigned to a second membrane module is additionally opened, so that during this method step, two control valves are open at the same time and two essentially stationary partial air streams occur, with which the first and the second membrane module are impacted. At the beginning of a third method step, the control valve assigned to the first membrane module is closed, for aeration of the second membrane module. All of the membrane modules are aerated in accordance with the three method steps, one after the other, until the aeration cycle starts anew with the first membrane module. In

this manner, Applicants' invention provides an inexpensive and simple way of aerating membrane modules, which is gentle on the membranes, while still aerating with a high reliability.

Because Applicants' method as recited in claim 11 uses control valves which can assume only either the open or closed position, both of the valves can be opened at the same time, as is recited in the second method step of amended claim 11, so that two essentially stationary partial air streams occur, with which the first and the second membrane module are impacted. Because the first and the second membrane modules are exposed only to a constant *partial* air flow during this method step, the loading on these membranes is small, but an effective cleaning is still accomplished. As a result, for the third method step the second membrane module can be exposed to the total air flow for a reduced amount of time in comparison to the time that would be required if no partial air flow had been performed previously. This reduced amount of time minimizes the loading of the membranes.

Thus, with reference to a first and second membrane module, the aeration of the second membrane module takes place in at least three method steps. At the beginning of the aeration of the second membrane module after opening the allocated control or

on/off switching valve, the control valve allocated to the first membrane mode is also simultaneously in the open position whereby both the first and the second membrane module are each exposed to a partial air flow ("second method step"). In the second method step, the control or switching valves allocated to each of the two membrane modules are opened simultaneously, specifically over a lengthy period of time in such a way that, during the second step two essentially stationary partial air streams are set. As discussed above, because the first and the second membrane module are exposed only to a constant partial air flow during this method step, the loading of the membranes is small. Despite the low loading, the membranes of the second membrane undergo effective cleaning. The duration of this method step can be adapted to the requirements without restriction so that the individual membranes are extensively cleaned apart from any firmly adhering contamination.

At the beginning of the following method step ("third method step"), the switching valve allocated to the first membrane is closed. As discussed above, the second membrane module is now exposed to the total air flow which results on the one hand in an increased loading and on the other hand in an intensified cleaning of the membranes. The small residues of contamination which could not be loosened in the previous method step are now

removed from the membranes. As a result of the cleaning which has already taken place in the preceding method step, a comparatively short exposure of the second membrane module to the total air flow is now required, which minimizes the loading of the membranes.

In the following method step ("first method step"), the control or switching valve allocated to another third membrane is additionally opened. The partial air flow acting on the second membrane module ensures that the dirt particles loosened in the preceding method step are transported away from the membranes and thus cannot contribute to any directed renewed contamination.

Thus, Applicants have found that extensive cleaning can be achieved by a partial air flow and that the lifetime of the membrane modules can be increased by the shortest possible action of the total air flow on the membrane module. Because simple control or on/off valves are used, Applicants' method as recited in claim 11 as amended can be carried out inexpensively and simply with a very high reliability.

Rabie et al. fails to disclose or suggest the specific steps of Applicants' method as set forth in amended claim 11, including opening two control valves at the same time so that two

essentially *stationary* partial air streams occur, with which the first and the second membrane module are impacted. *Rabie et al.* simply relates to a cleaning system for the aeration of several membrane modules in which the air flow of the individual methods is influenced with the aid of control valves. Although the Examiner has asserted that FIG. 4F of *Rabie et al.* shows the three method steps of claim 11 as amended and that at time 0-3 seconds and time 10-13 seconds Applicants' step two is shown as both the first control valve and the second control valve are open at that time, it is respectfully submitted that the Examiner's position is unfounded.

In *Rabie et al.*, at 0-3 seconds, the second branch (the solid line) is changing or moving from the open position to the closed position so that a *stationary* partial air stream at the second membrane module does **not** occur. Similarly, at 10-13 seconds the first branch (the dotted line) is changing or moving from the open position to the closed position so that a *stationary* partial air stream at the first membrane module does **not** occur. At the time ranges in FIG. 4F of *Rabie et al.* from 7-10 seconds and 17-20 seconds the streams produced are similarly both **not** *stationary*. *Stationary* partial air streams are also not described in the graph of FIG. 4E of *Rabie et al.* or in the graph of FIG. 3 of *Rabie et al.* The transition phases of *Rabie et al.*

are also short in comparison to the rest of the cycle, so that little contribution to the overall cleaning of the membranes is accomplished during these transition phases.

With Applicants' method as set forth in claim 11 as amended, during the second method step two membrane modules are exposed for a freely selectable time to a partial air flow obtained by dividing the total air flow and having a constant value. According to *Rabie et al.*, aeration of two membrane modules is provided only for a short time during short transition zones between the aeration of the individual membrane modules with the total air flow, the air flow to the respective membrane modules being varied continuously. As discussed above, the short transition phases during which a control valve is opened and at the same time another control valve is closed make no contribution or at least no quantifiable contribution to the cleaning of the membrane.

Rabie et al. additionally teaches away from using partial air streams to reduce load on the membranes, as all of the streams described (FIGS. 3, 4E, and 4F) expose each membrane mostly to the total stream air flow, which produces a maximum load on each membrane. As a result, the membrane will suffer wear more quickly over time. In contrast, with Applicants'

method as recited in amended claim 11, wherein stationary partial air streams occur for each repetition of the three disclosed steps, the membranes are affected more gently. The method used in FIG. 3 of *Rabie et al.* is particularly disclosed as having abrupt changes with bursts, spikes, and pressure surges, all which will provide large loading and wear on the membranes. See *Rabie et al.* at paragraph [0046].

The valves that are used to control the aeration streams shown in FIG. 4F and in FIG. 4E of *Rabie et al.* also operate at any position between the fully opened position and the fully closed position. See *Rabie et al.* at paragraph [0055] ("The time required to open or close (partially or fully as described) a slave valve 284 from its closed (fully or partially) or opened position respectively is preferably less than about 5 seconds and more preferably less than about 3 seconds....). In contrast, according to Applicants' method as recited in claim 11, control valves are used which can assume only either the open or closed position.

According to *Rabie et al.*, the individual modules are exposed to the total air flow for the longest time of their respective aeration. See FIGS. 3, 4E and 4F of *Rabie et al.* At the end of the aeration of one module, the control valve

allocated to the module is closed continuously for a time interval. By using three-way valves (FIGS. 4A, 4B; [0049], [0050]) or by direct electrical or mechanical coupling of the individual valves (FIGS. 4C, 4D; [0051], [0052]), the increase in the air flow to another membrane module is associated with a continuous reduction in the air flow to one membrane module.

Thus, an expensive control system, for example a servomotor or a pneumatic piston, is required to operate the control valves disclosed in *Rabie et al.* that operate at any position between the fully opened and fully closed positions. See *Rabie et al.* at paragraphs [0049], [0050], [0051], and [0052]. For example, the expensive control systems used to perform the method of *Rabie et al.* with the continuous opening and closing of the valves to intermediate positions between the fully closed and the fully open positions would require complicated repairing after breakdown. Also with valves that are operated to receive continuous, gradual opening and closing, more monitoring of the system is required as each valve must be checked to see if the valve reached the end position. See paragraphs [0059] and [0061] of *Rabie et al.* Thus, the method described by *Rabie et al.* for aeration of several membranes is not only expensive, but also liable to break down because the individual membrane modules are

mainly exposed to the total air flow during their aeration and the mechanical loading of the membrane is high.

Claim 16 depends on amended claim 11 and further includes the method step of impacting different groups of at least three membrane modules with the total air stream, within the aeration cycle, one group after the other. The air stream distributes itself approximately uniformly over the membrane modules that belong to the group, by means of opening of the control valves of that group. The control valves on all the other membrane modules are closed. In this manner, the time under which each membrane must endure a maximum loading of the aeration stream is further reduced.

It is respectfully submitted that *Rabie et al.* fails to disclose this step of claim 16 of different groups of at least three membrane modules being uniformly impacted by the overall air stream, one group after the other. The Examiner asserts that FIGS. 2 and 3 of *Rabie et al.* disclose this step of claim 16. But FIGS. 2 and 3 of *Rabie et al.* fail to disclose groups of at least three membranes receiving uniform impact from the stream, one group after the other. FIGS. 2 and 3 of *Rabie et al.* disclose three air delivery branches 240 and conduit aerators 238 receiving an equal impact at the end of the cycle, but at no time

during the cycle do the groups of three membranes receive a uniform impact from the air stream because those three membranes are open while the other membranes are closed. Accordingly, it is respectfully submitted that claim 16 is patentable over *Rabie et al.* for this additional reason.

Claim 18 is similarly patentable over the *Rabie et al.* reference for this reason. The Examiner asserts that the backwashing disclosed in paragraphs [0071] - [0075] of discloses the step recited in Applicants' claim 18. It is respectfully submitted, however, that backwashing uses a different air source from that used for the normal aerating steps. Applicants' claim 18 recites that the group of at least three membrane modules is impacted with *the* air stream. This air stream is the stream referred to in amended claim 11. The apparatus used in *Rabie et al.* will require an additional backwashing apparatus for operation with another air stream, which will add expense and complication to the system. See *Rabie et al.* at paragraph [0074] line 7. Applicants' method as further specified in claim 18 will reduce maximum load times on each membrane by impacting different groups of at least three membrane modules, without requiring additional backwashing apparatuses.

Accordingly, Applicants respectfully submit that claim 11 and claims 12-20 which depend directly or indirectly thereon are patentable over *Rabie et al.*

In summary, claims 11, 14, 15 and 17 have been amended, and new claim 20 has been added. FIGS. 2-7 have also been amended. In view of the foregoing, it is respectfully requested that the claims be allowed and that this application be passed to issue.

Respectfully submitted,
Stefan SCHÄFER ET AL.

Frederick J. Dorchak, Reg.No.29,298
Caleb D. Wilkes, Reg.No.60,873
Attorneys for Applicants

COLLARD & ROE, P.C.
1077 Northern Boulevard
Roslyn, New York 11576
(516) 365-9802
FJD:CDW

Enclosures:
Appendix with six (6) replacement sheets of drawings (FIGS. 2-7)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop: Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on July 1, 2009.

Amy Klein

R:\Patents\S\SCHÄFER, S. ET AL-3 PCT\Amendment First OA.wpd

APPENDIX